



ABOUT THE NEW MADRID SEISMIC ZONE

The New Madrid Seismic Zone Extends 120 Miles Southward from the area of Charleston, Missouri, and Cairo, Illinois, through New Madrid and Caruthersville, following Interstate 55 to Blytheville and on down to Marked Tree, Arkansas. The NMSZ consists of a series of large, ancient faults that are buried beneath thick, soft sediments. These faults cross five state lines and cross the Mississippi River in three places and the Ohio River in two places.

The New Madrid Seismic Zone and surrounding region is Active, Averaging More than 200 Measured Events per Year (Magnitude 1.0 or greater), about 20 per month. Tremors large enough to be felt (Magnitude 2.5 – 3.0) are noted annually. Every 18 months the fault releases a shock of 4.0 or more, capable of local minor damage. Magnitudes of 5.0 or greater occurring about once per decade can do significant damage and be felt in several states.

The Highest Earthquake Risk in the United States outside the West Coast is in the New Madrid Seismic Zone. Damaging temblors are not as frequent as in California, but when they do occur, the destruction covers over more than 20 times the area due to the nature of geologic materials in the region. The 1968 5.5 magnitude Dale, Illinois earthquake toppled chimneys and caused damage to unreinforced masonry in the St. Louis region, which is more than 100 miles from the epicenter.

A Damaging Earthquake in this Area, 6.0, occurs about once every 80 years (the last one in 1895 was centered near Charleston, Missouri). In 2002, the U.S. Geological Survey revised earthquake probabilities for the New Madrid Seismic Zone. For a magnitude 6.0 – 7.5 or greater earthquake, there now is estimated to be a 25-40% chance in 50 years. The results would be serious damage to un-reinforced masonry buildings and other structures from Memphis to St. Louis.

A Major Earthquake in this Area - the Great New Madrid Earthquake of 1811-12 was actually a series of over 2000 shocks in five months, some of 7.6 Magnitude and five of which were 8.0 or more in magnitude. Eighteen of these rang church bells on the Eastern seaboard. The very land itself was destroyed in the Missouri Bootheel, making it unfit even for farming for many years. It was the largest release of seismic energy east of the Rocky Mountains in the history of the U.S. and was several times larger than the San Francisco quake of 1905.

When Will Another Great Earthquake Happen the Size of Those in 1811-12? Several lines of research suggest that the catastrophic upheavals like those in 1811-12 visit the New Madrid region every 500-600 years. Hence, emergency planners, engineers, and seismologists do not expect a repeat of the intensity of the 1811-12 series for at least 100 years or more. However, even though the chance is remote, experts estimate the chances for a repeat earthquake of similar magnitude to the

1811-1812 New Madrid earthquakes have changed from the 1985 estimates of 2.7 – 4.0% probability in the next 50 years to a 7 - 10% probability. This is a result of new geological evidence for shorter recurrence intervals that identify pre-historical earthquake events. Earthquake probabilities for known active faults always increase with time, because stresses within the earth slowly and inexorably mount, year by year, until the rocks suddenly rupture.

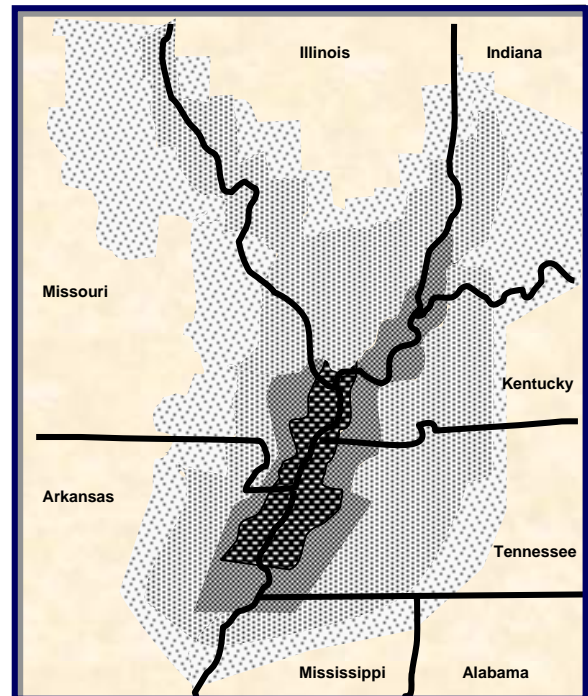
Where do earthquakes occur? In the central United States the greatest number of earthquakes annually are associated with the area just south of the confluence of the Ohio and Mississippi rivers. However, other fault zones produce felt earthquakes, including some that have caused structural damage and injuries.

Our Greatest Concerns are the 6.0-7.6 Sized Events, which do have significant probabilities in the near future. Damaging earthquakes of this magnitude are very likely within the lifetimes of our children.

What Can We Do to Protect Ourselves? Education, planning, proper building construction, and preparedness are proven means to minimize earthquake losses, deaths, and injuries. In recent memory, San Francisco and Armenia both experienced 6.0-7.1 magnitude quakes. San Francisco prepared by defining potential geological hazard areas, adopting earthquake resistant building design codes and educating the public; Armenia had not adopted similar hazard planning strategies. San Francisco suffered 67 deaths and less than \$7 billion in property losses.

Armenia had over 25,000 deaths and lost more than \$20 billion. More recently, Alaska underwent a 7.9 earthquake. Losses were minimized in this event because the epicenter was in a remote location. Missouri and the Midwest are more prepared than Armenia, but only partly as prepared as San Francisco, and the epicenter is not likely to be in a totally isolated area.

What does earthquake Magnitude mean? Earthquake magnitudes are commonly reported as a “Richter scale” number. Richter magnitude refers to the measurement of the amplitude of the seismograph record and not the size, or energy released by the earthquake itself. Modern earthquake magnitude measurements are based on area ruptured by the causative fault and the strength of earth materials that are ruptured during an earthquake. These newer magnitude measurements are a more accurate way to describe earthquake strength.



The New Madrid Fault is a complex zone of seismically active fractures in bedrock buried several thousand feet beneath river sands and mud. An earthquake's severity is greatest at its focal point, known as the epicenter, but lessens as the distance from the epicenter increases. The hachured areas on the map above show possible damage levels of a 7.6 earthquake event. The darkest area on the map portrays an epicenter, potentially the area of greatest damage.

What is site response? Site response refers to the observed or predicted behavior of geological materials to earthquake shaking. Geologic hazard maps define earthquake hazards based on the distribution types of these unconsolidated materials. River or stream sediments can liquefy during large earthquakes and cause damage to structures as they partly sink or tilt. Ground motion can also be amplified in areas that have soft, thick soils. Areas that have thin and stiff soils over dense hard bedrock can be expected to have lower levels of shaking and associated structural damage.

How Much Increase in Energy Does Each Unit of the Richter Scale Represent? Each whole magnitude number increase represents 10 times the amplitude recorded by a seismograph. The energy release difference for the same whole number magnitude is 31 times.

If a Fault Has Lots of Little Earthquakes, Will Larger Ones Be Prevented? The answer is, “No”. A magnitude 6.0 (which is damaging) releases 1,000 times more energy than a 4.0 (which is not damaging). An 8.0 (which is devastating) is 1,000 times larger than a 6.0. In other words, a fault would have to have 1,000 4.0 events to prevent the occurrence of a single 6.0, or a million 4.0 events (1,000 times 1,000) to prevent a single 8.0.

We Have a Choice. While we still have time, we can get ready and cut our losses, or we can do little or nothing and be caught unprepared. We cannot prevent the coming of an earthquake – it will happen – but we can reduce the potential loss of life. Write the Missouri State Emergency Management Agency or call (573) 526-9100 for free literature on protecting yourself and your property.

SEMA/FEMA/DNR EQ maps are free except for shipping & handling. For a free earthquake map, call the DGLS publications telephone number at (573) 368-2125

(SEMA in coordination with the Department of Natural Resources Division of Geology and Land Survey revised this fact sheet in January 2006.
This fact sheet was formerly distributed by the Southeast Missouri State University's Center for Earthquake Studies.)

